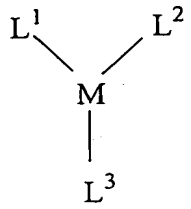
CLAIMS

1, A process for producing a polyether, which comprises ring-opening-polymerizing at least one substituted epoxide, except for propylene oxide and epihalohydrin, in the presence of a rare earth metal compound represented by the formula (I) and a reducing compound:



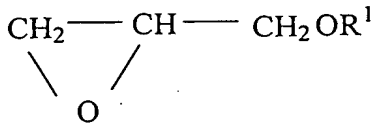
(I)

wherein

M represents a rare earth element selected from Sc, Y and lanthanide, and

L^1, L^2 and L^3 are same as or different from each other and each of them represents an oxygen-binding ligand.

2, The process for producing the polyether as claimed in Claim 1, wherein the substituted epoxide is a compound represented by the formula (II):



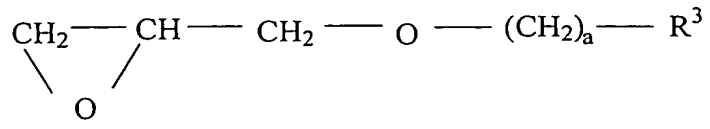
(II)

wherein

R^1 represents a hydrocarbon group which may have a substituent and which has 1 to 500 carbon atoms, represents an acyl group having 1 to 30 carbon atoms, represents an alkyl sulfonyl group having 1 to 30 carbon atoms or an aryl sulfonyl group having 6 to 30 carbon atoms or represents a group represented by $-(AO)_n-R^2$

wherein R^2 represents a hydrocarbon group, a fluoroalkyl group or a fluoroalkenyl group, which may have a substituent and which has 1 to 30 carbon atoms, or a fluoroaryl group, which may have a substituent and which has 6 to 30 carbon atoms, or represents a siloxysilyl group having 1 to 50 silicon atoms; A represents an alkylene group having 2 or 3 carbon atoms; and n represents a number selected from 1 to 1,000.

3, The process for producing the polyether as claimed in Claim 1, wherein the substituted epoxide is a compound represented by the formula (III):



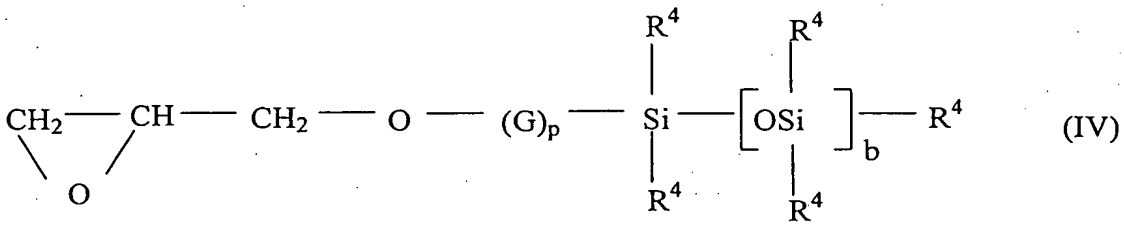
(III)

wherein

R^3 represents a fluoroalkyl group or fluoroalkenyl group, which may have a substituent and which has 1 to 30 carbon atoms, or a fluoroaryl group, which may have a substituent and which has 6 to 30 carbon atoms, and

a represents a number selected from 0 to 20.

4, The process for producing the polyether as claimed in Claim 1, wherein the substituted epoxide is a compound represented by the formula (IV):



(IV)

wherein

all of plural R^4s are same as or different from each other, and each of plural R^4s represents a hydrocarbon group which may have a substituent and which has 1 to 30 carbon atoms or represents a siloxy group which may have a substituent and which has 1 to 200 silicon atoms,

G represents an alkylene group, which may have a substituent and which has 1 to 20 carbon atoms, or an arylene group

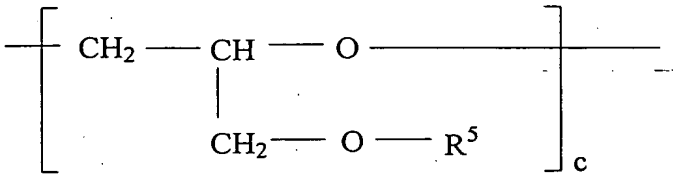
b represents a number selected from 1 to 500 as an average

value of plural numbers or represents an integer of 1 to 20 as a single number, and

p represents a number selected from 0 and 1.

5, The process for producing the polyether as claimed in Claim 1, wherein the substituted epoxide is glycidol.

6, A polyether represented by the formula (V):



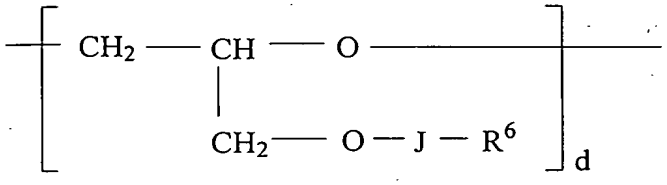
(V)

wherein

R^5 represents a hydrocarbon group which may have a substituent and which has 8 to 50 carbon atoms, and

c represents a number being 150 or more on the average.

7, A polyether represented by the formula (VI):



(VI)

wherein

R^6 represents a fluoroalkyl group having 2 to 30 carbon atoms,

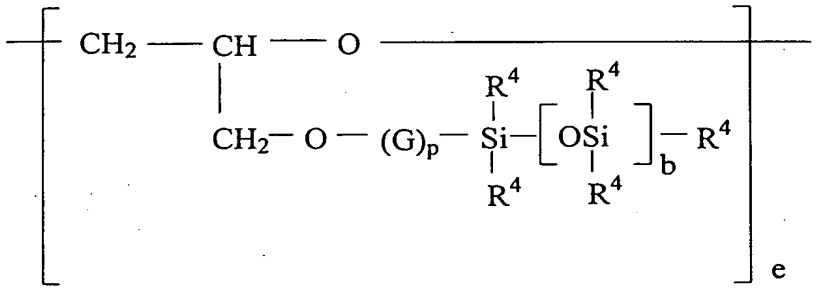
J represents an alkylene group having 1 to 20 carbon atoms, and

d represents a number being 5 or more on the average.

8, The polyether as claimed in Claim 7, wherein the R^6 group is a perfluoroalkyl group.

9, The polyether as claimed in Claim 7, wherein at least one terminal group of the R^6 groups is a $-CF_2H$ group and the residue obtained by removing the $-CF_2H$ group from the R^6 group is a perfluoroalkylene group.

10, A polyether represented by the formula (VII):



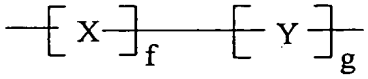
(VII)

wherein

R^4, G, b and p represent the mean as defined in claim 4, and

e represents a number being 5 or more on the average.

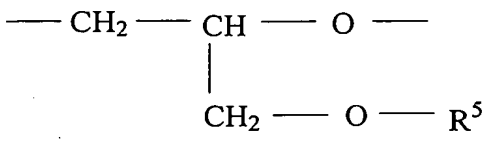
11, A polyether represented by the formula (VIII):

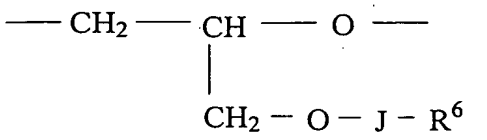


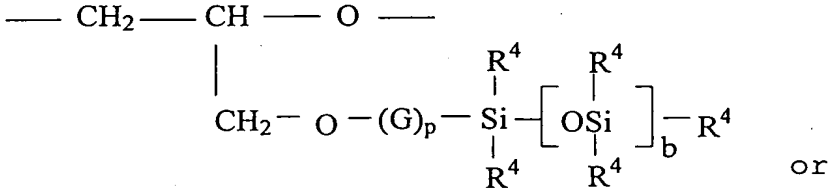
(VIII)

wherein

X represents







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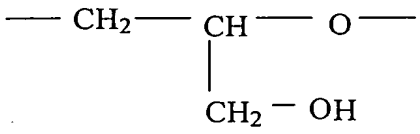
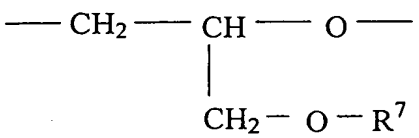


in which R^5 represents the mean as defined in claim 6, R^6 and J represents the mean as defined in claim 7, and R^4, G, b and p represent the mean as defined in claim 4,

Y represents



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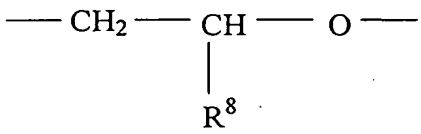
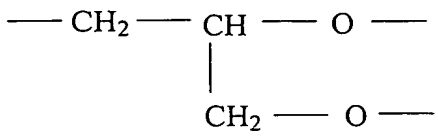


, represents a group represented by X (provided the case in which X and Y are the same is excluded), or represents a group originated from an anionic-polymerizable monomer other than the substituted epoxide, in which case Y may be plural types,

in which R^7 represents a hydrocarbon group having 1 to 7 carbon atoms or represents a trialkyl (an alkyl group has 1 to 4 carbon atoms) silyl group,

R^8 represents a hydrogen atom or represents a hydrocarbon group or halogen-substituted hydrocarbon group having 1 to 22 carbon atoms,

f represents a number of 150 or more when X is



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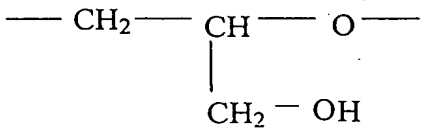

and represents a number of 5 or more when X is the other group, and

g represents a number being 5 or more.